Involving Players With Special Needs in Games User Research

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Takeaways

- Provides four case studies of projects that investigated the process of Games User Research with audiences with special needs, for example, older adults in long-term care, and young people with disabilities.
- Provides recommendations for constructively and respectfully involving special populations in Games User Research.
- Identifies specific cognitive, physical, emotional and social considerations relevant for both the organization of the design process, and the functionality of the designed artifacts
- Discusses the broad problem of designing challenging yet enjoyable games for populations that already faces significant challenges.

Three-sentence-outline

This chapter provides an overview of challenges that emerge from the involvement of players with special needs in game development, focusing on user involvement in early design stages, and challenges that emerge during playtesting. Through case studies focusing on young children, people with disabilities, and older adults, it offers insights into appropriate methodology for games user research with diverse audiences, and it discusses strategies to establish a respectful, and empowering process for user involvement.

Guiding Questions

This chapter is intended to provide guidance for game developers and researchers intending to co-design and evaluate interactive experiences with populations such as young children and people with cognitive disabilities, contexts in which opportunities for communication between researcher and participant must be thoughtfully designed.

Abstract

Involving audiences with diverse needs in Games User Research can be difficult. This chapter provides an overview of challenges that emerge from the involvement of special populations in game development, focusing on user involvement in early design stages, and challenges that emerge during playtesting. Through case studies focusing on young children, people with disabilities, and older adults, it offers insights into appropriate methodologies for games user research with diverse audiences, and it discusses strategies that can assist researchers and developers wishing to establish a respectful, and empowering process for user involvement.

1. Introduction

Player involvement in the development process through Games User Research (GUR) is a crucial step in adapting games to the needs of players. Working collaboratively with diverse audiences can contribute to the design of more inclusive games, and assist in the development of serious and educational games wishing to target specific groups of players. However,

involving special populations in GUR can be challenging: participants may have a different experience with many technologies in terms of accessibility and usability, and some impairments and disabilities influence participants' abilities of engaging with some of the standard tools in GUR, as for example questionnaires on player experience. Therefore, involving diverse audiences in GUR requires a detailed understanding of: the needs of that specific groups of players, the impact that engagement with games in a research context can have on players, and common challenges that arise throughout the research process when working with participants who have special needs.

This chapter discusses case studies to outline challenges in GUR when working with diverse audiences. It discusses a series of case studies, and focuses on offering a methodological toolbox and further considerations that can assist game developers and researchers in the establishment of a respectful and empowering GUR process.

2. Case Studies

This section offers an overview of four case studies that illustrate common challenges and opportunities when engaging audiences with special needs in GUR, focusing on older adults and young people with disabilities. For each case study, we provide an outline of the characteristics of participants involved in the research, methodological approaches, and challenges and opportunities that were observed.

2.1 Games User Research With Older Adults

Older adults are a growing demographic, and are becoming increasingly engaged with game playing. Catering to this audience offers game developers new markets and new commercial opportunities. Moreover, game playing also offers older adults in residential care the potential for entertaining new types of cognitive, social and physical exertion, thereby contributing to their quality of life. However, when designing for this audience, the impact of age-related changes and impairments can introduce challenges for prospective players, increasing the need for careful and well-designed user involvement throughout the development process.

2.1.1 Case Study 1: Movement-Based Games for Older Adults in Residential Care

Movement-based games hold the promise of providing cognitive and physical stimulation for older adults in residential care. This case study explores the design of movement-based game interaction for older adults who experience age-related changes and impairments through the development of a gesture-controlled game, implemented using the Microsoft Kinect camera [6].

2.1.1.1 Research Approach and Participants

The study was carried out together with Sherbrooke Community Centre in Saskatoon, Canada, a care facility that caters to older adults who experience a wide range of age-related changes and impairments. It was conducted in two steps, first assessing the suitability of different gestures through an analysis tool, and then integrating a set of movements into a gesture-controlled gardening game. All sessions took place in the media room of the care facility. Each session lasted about 30 minutes including five to ten minutes of interaction with the analysis tool and game. Participants took part individually, and were accompanied by a staff member, who was also involved in their recruitment.

Fifteen older adults participated in the first step of the research. The average age was 74 years (range 60 to 90, 7 female). Out of all participants, 13 older adults used wheelchairs, and one person relied on a cane as walking support. Six participants reported hemiplegia as a result of stroke. Eight participants had previous experience playing video games. Twelve older adults were involved in the evaluation of the final game. The average age was 77 (range 60 to 91, 5 female), eleven participants used wheelchairs, and six participants had hemiplegia.

The research was approved by the University of Saskatchewan Behavioural Ethics Research Board, as well as the Saskatoon Health Region. We gathered written consent from all participants.

2.1.1.2 GUR Methodology

The case study adopted a quantitative approach to explore accessibility, usability, and player experience. Both steps of the research involved a standardized questionnaire to explore participant mood (using the Positive Negative Affect Schedule, PANAS[1]), and an individually designed questionnaire to gain insights into players' experiences carrying out gestures and playing the game. Additionally, metrics and observations were included to give further insights into overall performance, and instances in which player characteristics had an impact on their engagement with the game.

2.1.1.3 Challenges and Opportunities

Through the research, we identified a number of challenges that must be considered when engaging institutionalized older adults in GUR. Most importantly, despite catering to a **broad range of skills and abilities** in our initial game designs (e.g., by working with a physical therapist to identify suitable movements, including a calibration routine in our game that adapted the interface to a player's range of motion, and adjusting difficulty levels to player speed), some participants still struggled to carry out the movements required to play, or found it difficult to understand in-game tasks. In some cases, this prompted participants to reflect upon their abilities, or led to frustration when they could only complete the game after the second or third attempt, suggesting that levels of challenge required to interact with and successfully complete games needs to be considered at a very basic level. We observed that older adults diagnosed with **cognitive impairments** particularly struggled, not only when learning how to interact with the game, but also when completing other parts of the research process. We observed that some participants required additional time to complete questionnaires, and sometimes experienced difficulties when following instructions (for example, when trying to quantify their emotional state as required by the PANAS questionnaire), underlining the importance of investigator support throughout the entire process. Likewise, some participants who had **little previous experience with technology** in general and games in particular found it difficult to find the correct words to refer to elements of our study to describe their experience. Additionally, not having played video games before might also influence their perception of our game, leaving participants without a comparable previous experience, or expectations of what engaging with a game would feel like. From a methodological perspective, since verbal communication in this study often allowed only a small window on participants' experiences, **observations and metrics were immensely helpful.** They deepened our understanding of instances where players experienced difficulty, accomplishment and joy.

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[1] Watson, D., Clark, L.A., and Tellegan, A. Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology 56, 6 (1988), 1063-1070.

2.1.2 Case Study 2: Exploring the Value of Social Play for Older Adults in Residential Care

This case study explored how older adults in long-term care engage with games in a social setting. It compares results from two care facilities; a senior residence catering to independent older adults, and a care home offering high levels of support. Studies were carried out over the course of three months in both locations to gain insights into similarities and differences in how both groups engage with games "in the wild" [4].

2.1.2.1 Research Approach and Participants

The study focused on weekly hour-long gaming sessions that were offered at both care facilities over the course of three months. Video games were advertised on the official activities schedule, similar to other leisure activities offered at both facilities. Older adults were recruited with the help of staff, and encouraged to get together in groups to play both custom-designed and commercially available (for example, Kinect Sports Bowling) movement-based games. Sessions were facilitated by a researcher; at the beginning of the study, all participants received a comprehensive introduction to the Kinect system and all games. At the senior residence, facilitation of the sessions was gradually transferred away from the researchers to the residents themselves. During the sessions, participants took turns playing the games, and were given the opportunity to compete with each other, e.g., in Bowling. Gaming sessions at the senior residence continued in a group setting throughout the study. In contrast, after the first month, gaming sessions at the care home were changed to individual activities at the request of residents, who felt that engaging with games in a social setting was problematic.

A total of sixteen older adults (eight female) participated in the study, ten people at the senior residence, and six participants at the care home. The average age of participants was 79 at the senior residence, and 74 at the care home. Four participants at the senior residence used walkers for assistance, one participant used a wheelchair, and five participants were able to walk independently, whereas all participants at the care home were using wheelchairs. A screening of cognitive abilities (see GUR Methodology below) revealed that all but one of the participants at the senior residence had no cognitive impairments, whereas all participants at the nursing home had already experienced severe changes in cognition.

The research was approved by the Saskatchewan Behavioural Ethics Research Board, as well as the Saskatoon Health Region. We gathered written consent from participants at the senior residence, and oral assent witnessed by a guardian from participants at the care home.

2.1.2.2 GUR Methodology

This study adopted a qualitative approach, combining observations made throughout the gaming sessions with monthly group interviews exploring player perspectives on games in general, and as a social activity in particular. Following changes at the care home, individual interviews were carried out to accommodate the needs of older adults experiencing severe age-related changes and impairments. At the beginning of the study, participants were screened for cognitive impairment using the Mini-Mental State Exam[2] (MMSE).

2.1.2.3 Challenges and Opportunities

[2] Folstein, M.F., Folstein, S.E., and McHugh, P.R. "Mini-Mental State" – A Practical Method for Grading the Cognitive State of Patiens for the Clinician. J Psychiat Res 12, (1975), 189-198.

While working with both groups of older adults, we identified challenges and opportunities associated with their experience with games, along with the impact of skills and abilities prevalent in both groups. The study revealed a **strong impact of combined cognitive and physical impairment** on their interest in engaging with games in a social setting. Particularly at the nursing home, we found that delays in turn-taking caused by physical impairment, long periods of time required to engage with the games, and difficulties among participants communicating with each other as a result of cognitive impairment created instances of frustration and vulnerability. Observation of play sessions demonstrated that it was very difficult to design accessible, yet interesting experiences for participants who had a wide range of skills and abilities. Most surprisingly, the **social setting in which games were played introduced additional challenges**. The social setting was unexpectedly problematic, as it enabled players to observe the performances of others, reflecting upon their own abilities, and the impact of ageing. While most participants started out on a level playing field, the long-term nature of the study revealed that some players developed their skills faster than others, sometimes leading to frustration among participants struggling to engage with the games, for example, if the impact of age-related changes was stronger on a certain day. From a methodological perspective, **long-term observations provided valuable insights**, as these allowed us to study experience over time, which also helped participants overcome challenges associated with a lack of familiarity with games and, on the other hand, allowed us to overcome any novelty effects that may be present in a short term study. When working with older adults at the senior residence, questionnaires were effective, and focus group interviews gave an opportunity to tease out emergent ideas from the group. In contrast, participants at the care home with significant cognitive impairments were interviewed individually to account for their situation.

2.2 Games User Research With Persons With Disabilities

Involving people with disabilities in games user research is the first step toward creating interactive experiences that are tailored to their needs and ideas. However, there are a number of challenges that need to be considered prior to player involvement that we discuss through two case studies focusing on the involvement of young people with complex needs in game development.

2.2.1 Case Study 3: Games for Young People With Neurological Vision Impairment

Neurological Vision Impairment (NVI) is a term that describes vision impairment caused by injury to areas of the brain that are responsible for visual processing. NVI detrimentally impacts upon quality of life. Recently, therapy strategies that focus on training peoples' eye movements have been demonstrated as effective at improving functional vision for people with NVI. These therapies require participants to repetitively search an array of monochromatic on-screen stimuli in order to find target stimuli. Therapy must be undertaken in 30-minute sessions multiple times per week for a number of months. While adult stroke patients have previously demonstrated adherence to these types of interventions, this has not yet been demonstrated with children, nor, we would argue, is such a demonstration likely, due to the repetitive and boring nature of the task. We report on a project explores the design of a game-based vision therapy program that aims to support participant engagement and adherence [5].

2.2.1.1 Research Approach and Participants

This project was carried out in close collaboration with the WESC Foundation in Exeter, UK, which is a specialist education center for people with visual impairment. The project involved a highly iterative design and evaluation procedure. Beginning with a basic prototype that closely resembled the tasks used with adults, fortnightly design sessions were held over a six-month period, in which participants were observed playing the game and were asked to provide feedback. Information gathered from these sessions was used to gradually improve the design of the game, through collaboratively selecting activities and features that were most appealing to players.

The primary group of participants, with whom we worked closely, were four people (3 female, 1 male), aged 18-20, recruited through a specialist education center for learners with vision impairment. Two participants had an undiagnosed neurological presentation with associated developmental delay, learning, speech and language difficulties. One participant had been diagnosed with a tumor on the optic chiasm at 6 years old and had associated optic atrophy at the time of participating. The fourth participant had a confirmed diagnosis of cerebral palsy and left hemiplegia and unconfirmed NVI. Two participants were legally blind and two were described as having low vision.

A second group of participants consisted of three young people with acquired brain injury and suspected hemianopia who were part of a local community group organized by an occupational therapist. Each person in this group had relatively minor cognitive and physical impairments, thus more traditional co-design activities were possible. Data was collected from these participants during a one-off design session that lasted approximately two hours.

The research was approved by the University of Lincoln School of Psychology Research Ethics Committee, as well as the WESC Foundation research ethics committee. Initial approach to potential participants was made by their college tutor. Candidates were informed about the study by a researcher who dictated a verbal information sheet, and gave formal consent by initialing (or placing a cross) in a large bold box under a transcript of the information.

2.2.1.2 GUR Methodology

We began the project intending to undertake a participatory co-design methodology (similar to that described in 2.2.1). That is, in order to ensure that the game best fulfilled the needs of users, we intended on involving those users centrally and collaboratively within all design activities and decisions. We held regular design sessions with participants every two weeks over a six-month period. Each session typically involved participants playing the latest version of the game, for varying amounts of time, and providing feedback to the researcher. The researcher both engaged in the session and took notes. In earlier stages of the design process, when only rough prototypes were available, these play sessions were typically quite brief (5-10 minutes). In order to assess player preference, multiple prototypes were created and the researcher noted which version was most enthusiastically engaged with by participants. These comparisons facilitated specific design decisions, such as whether to include borders on shapes, or whether to include animations. Towards the end of the six-month period, when a complete game was available, sessions lasted 30-45 minutes, with participants attempting multiple play-throughs of the game.

In practice, there were a number of factors that significantly undermined our ability to undertake genuinely participatory design in this project. Firstly, there are significant constraints when working in the health domain. Our intervention strategy – treatment of NVI

through compensatory eye movements - is based on an existing intervention, which has already been demonstrated as clinically useful with adults. The long-term success criterion for our project is the demonstration of significant improvements in the functional vision of participants, brought about through playing of the game. In order to demonstrate such an improvement, and provide evidence of the standard acceptable to health practitioners, a randomized controlled trial (RCT) must be undertaken. However, the research ethics committee for the health service, quite rightly, does not allow speculative projects to undergo RCT. There must be some logical justification for why the therapy should work. In this case, this meant that some of the features of that original therapy, such as the repeated searching of the entire visual field, were non-negotiable features of the final design, regardless of anything that happened at design sessions. Thus, our work is not strictly participatory, nor collaborative, since there were non-negotiable features of the final game.

Secondly, there were significant challenges in communicating constructively with participants about design work in this project. Participatory design requires constructive, empathic dialogue between designers, users and communities. It requires the participants to own the process and to hold researchers to account for decisions made. There is always a concern in working with participants with cognitive, verbal and social disabilities, that the same two-way dynamic is not present and, regardless of intentions, the researcher can be seen as using the participant as a resource, much like in a more traditional user-centered design context. Indeed, in our project, we found that participants almost never complained or expressed frustration with our game as long as they were able to play it with even the most basic level of success.

A further difficulty arose in our study in that our participants refused us permission to have their voices recorded, or the sessions video recorded. Thus, design sessions were recorded only via notes made by the researcher. This is a limitation of the work, as it renders findings open to bias from that one individual.

2.2.1.3 Challenges and Opportunities

The key contributor to the success of these sessions was the relationship and trust that had been built up between the researcher and participants over the course of his two-year placement at the center. We suggest that it would have been very difficult to facilitate productive design sessions if the researcher simply visited the center on a fortnightly or weekly basis to gather information and leave. Through undertaking this project we found significant challenges inherent in delivering therapy programs through the format of a game.

Designing ‘challenge’ in therapy-specific games is more complicated than in other games, as it is difficult for the designer to understand which activities participants will find too easy, and which they will find almost impossible. Moreover, there are **two distinct types of challenges presented by a therapeutic game to the player**. Firstly, the therapeutic task itself will represent a challenge for the player to undertake. Therapy necessitates repetition of skills or behaviours that the player is not proficient or comfortable in performing. Secondly, in order to present engaging and meaningful experiences for players, games must present appropriate levels of game challenge to participants. These in-game challenges are the central means through which games generate the motivation and engagement that is valuable in the context of therapy. Players get bored of, and lose interest in, games that are too easy, while they become frustrated with games that are too difficult. Indeed, in our study, some participants who were legally blind with very poor visual acuity had little difficulty playing the game. At the same time, games that are too difficult for the player are potentially de-motivating. Both of these types of challenge can function as a source of frustration for players, and have the

potential to undermine the engaging qualities of the game. The **use of a visual medium for the purposes of vision therapy** presents notable challenges. Research on design for people with vision impairment typically focuses on the substitution of visual interface elements with stimuli that address other senses (e.g., hearing, touch). This approach is not appropriate in the context of vision therapy. Functional vision rehabilitation builds on the presentation of visual cues to encourage people with vision impairment to develop compensatory strategies such as eye and head movements to improve the effectiveness of visual scanning. To achieve this goal, players must complete search tasks using their visual skills, and displayed images should not be completely replaced with haptic or audio interface elements.

2.2.1 Case Study 4: Games for Children and Teenagers Who Use Powered Wheelchairs

To explore opportunities in motion-based game design for children and teenagers who use powered wheelchairs, we worked with a school that provides education for young people with special needs. Throughout the game development process, our goal was to better understand how young people using wheelchairs perceive themselves with respect to video game play, their perceptions of motion-based games, and their thoughts on wheelchair-based game input [1].

2.2.2.1 Research Approach and Participants

The project was carried out in collaboration with a local school, and included two steps. First, participants were invited to attend four focus groups over the course of two months that were designed to give them an opportunity to share their perspectives on gaming, disability, and movement-based play. Based on these focus groups, which included a co-design component during the later stages, three movement-based games were developed, and evaluated in the second step of the project during which participants were invited to engage with the games either in pairs or individually.

Participants of this case study had a wide range of physical and cognitive abilities. During the first phase of the project, we worked with two groups of children and young adults over the course of four months. In total, nine participants took part during this phase, and they were aged 13 to 22 (3 female). All participants used powered wheelchairs; medical conditions ranged from spinal cord injury as the result of accident to progressive neurodegenerative diseases and developmental conditions such as Cerebral Palsy. While most participants could express themselves through speech, one participant was non-verbal and required the assistance of staff, and another participant applied assistive technology (iPad application generating speech) to participate in our design sessions. During the second phase of the project, we worked with four young people using powered wheelchairs (age range 16 to 18), again, participants had a wide range of physical and cognitive abilities. Additionally, other students were given the opportunity to try the games, but their data was not included in the study because they did not match the inclusion criteria (e.g., no use of powered wheelchairs).

The research was approved by the University of Lincoln College of Science ethics board. We obtained written consent from participants' legal guardians, and followed an oral assent protocol where participants where informed about the goals of the study, and were asked to verbally consent to participation.

2.2.2.2 GUR Methodology

Within the focus groups during the first part of the study, we applied different methods to encourage participants to reflect upon themselves, their relationship with games, and disability. For each focus group, we prepared guiding questions, and additional props and approaches if necessary. For example, we applied methods from visual sociology[3] to create drawings that represented participants in order to explore which aspects of themselves they considered important, and we included props, screenshots, and short game descriptions to help guide group discussion during later stages. Sessions were audio-recorded and transcribed. During the second part of the study, we adopted a qualitative approach that allowed us to explore in-depth the experience that players had with the resulting games during gaming sessions. We developed three games of varying complexity: Speed Slope, a downhill skiing game, Rumble Robots 3D, a robot boxing game, and Rainbow Journey, a playful sensory experience without set goals. Observations were made by one researcher while another one provided assistance throughout play, and followed up with participants in short post-play interviews exploring their experience. Again, all sessions were also audio recorded, and transcripts and observations were combined into a document allowing us to arrive at a comprehensive understanding of the gaming sessions. All sessions were accompanied by at least one member of staff.

2.2.2.3 Challenges and Opportunities

There were a number of challenges that emerged throughout this case study, some relating to the cognitive and physical abilities of participants, and others emerging from the research context in a school setting. Specifically during the focus group stage, hosting a group of young people with **mixed abilities** comes with a number of unique challenges. There were many occasions where the investigator had to intervene to encourage the group to stay on topic, and there were some instances of frustration if participants required a lot of time to express their opinions (e.g., because they experienced difficulties speaking). Additionally, there were many instances of participants talking at the same time, along with background noise and other sounds that impacted the transcription stage of the project. Regarding the testing stage of the case study, participants' cognitive and physical abilities impacted the research process. Often, **individuals with cognitive impairments required continuous assistance** when playing the games, and some experienced difficulties engaging with more complex game concepts (e.g., hitting goals in Speed Slope). Similar to the first stage, eliciting feedback from some participants took more time, requiring a flexible scheduling system. Likewise, **players with severe mobility impairments experienced difficulty when trying to excel at the games** as differences in their level of wheelchair control influenced in-game performance. To this end, working with a broad range of games in terms of complexity and difficulty was beneficial as it ensured that all players would be able to interact with at least one of the games. Another challenge that emerged from the setting – testing the games at a school – was that word of mouth spread about the study, and students who did not meet the inclusion criteria for our research (e.g., students using manual wheelchairs) became interested in playing the games. With the support of staff, we decided to **facilitate gaming sessions for individual students without including their data** in our study to avoid disappointment and a negative impact on relationships among students. Similar to previous studies, we found that making **observations in combination with interviews** was an effective means of eliciting detail on participants' experience and opinions. In this context, the presence of two researchers for all sessions was beneficial as it allowed us to make extensive observations while flexibly adapting our processes to individual participant needs.

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[3] Luc Pauwels. 2010. Visual Sociology Reframed: An Analytical Synthesis and Discussion of Visual Methods in Social and Cultural Research. Sociological Methods & Research 38, 4 (May 2010), 545-581.

Generally, these case studies illustrate some of the challenges and opportunities that emerge in the context of GUR with audiences with special needs. In the following section, we discuss emerging themes, and provide recommendations for GUR with diverse user groups to help researchers and practitioners address the most common challenges.

3. Recommendations for Games User Research With Diverse User Groups

Based on the insights from the above case studies, we provide a set of recommendations for researchers and practitioners wishing to carry out Games User Research with diverse audiences. In this section, we focus on four core aspects: considerations that are necessary to reflect (1) the needs of participants, (2) methodological and procedural requirements, (3) the special nature of game development, and (4) the impact that the research setting can have on GUR with special populations.

3.1 Considerations Regarding Participants

Impairments and disabilities can have a strong impact on participants' ability to engage with games, and Games User Research. It is important that researchers reflect upon potential triggers for frustration throughout the design of their research, and understand difficulties that are associated with certain participant groups, for example, persons with complex needs.

One of the drawbacks to the involvement of players with special needs is the significant potential – as a by-product of the process of exploring and testing activities that participants find challenging – for the exposure of participant vulnerabilities. For example, during design sessions to create games for young people with NVI (Case Study 3), we had to ask questions of our participants regarding whether they could see on-screen items and whether they could discriminate between different shapes, because this is the goal of the scanning task. Designers in this situation, as in any situation working with vulnerable participants, cannot avoid reminding participants of the limits of their abilities, something that has the potential to cause upset. Likewise, our work with young people using powered wheelchairs (Case Study 4) explored questions around physical abilities and assistive devices, both of which had potential to encourage participants to reflect upon their own situation.

To this end, involving staff in participant recruitment offers an opportunity of ensuring that only those individuals able to cope with the research process are invited to participate, reducing the risk of vulnerability among prospective participants who would have experienced frustration as a result of procedural requirements of the research.

3.2 Methodological and Procedural Considerations

From a methodological and procedural viewpoint, participant abilities need to be considered to establish a respectful research process that benefits all stakeholders. To this end, standard approaches involving player experience questionnaires and interviews can be difficult, particularly when working with participants with cognitive impairments, or if physical impairments impact participants' motor skills. Instead, it may be more suitable to work with a combination of carefully guided interviews, and extensive observations that are made throughout the entire research process.

Particularly when working with groups of people, having the support of a second investigator can be invaluable in ensuring a smooth research process along with high-quality observations. Additionally, generous session scheduling should be considered so that buffer time is

available when dealing with unexpected situations, or if participants need more time to complete parts of the research. Finally, we would like to emphasize the responsibility that researchers generally bear when working with human participants, and which is particularly important when working with vulnerable audiences. In many of the case studies presented in this chapter, there were instances where accommodating participants' needs meant adapting our research process, possibly negatively impacting the quality of data, for example, changing the research protocol for one of the groups in our work on older adults' long-term engagement with games. Therefore, we recommend flexible research approaches that leave room to accommodate participant needs; to this end, qualitative approaches often offer better opportunities of addressing and exploring issues that emerge throughout the research process.

3.3 Game-related Considerations

The case studies also demonstrate the importance that considering player abilities throughout the design and development process has for the Games User Research Stage. As games need to find the right level of challenge to provide a positive player experience, it is important to keep in mind that early prototypes can bear the risk of overwhelming players, possibly leading to a frustrating experience that exposes vulnerability. To this end, we recommend that even at early stages, games need to be flexible in terms of adapting to player abilities, or researchers need to make a range of games available to participants that cater to different abilities.

Likewise, challenge is a complex consideration in projects that aim to deliver therapy through game play. Therapeutic games present two different types of challenge to players. Each of these has the potential to cause frustration and disengagement to players and must be carefully considered and investigated through the design process. Firstly, Game-related challenges provide a frame for the action in the game. Players work to overcome challenges. They must take some actions in order to progress through the game and receive rewards. Games that are too easy or too difficult do not motivate players to keep playing. Secondly, therapy-related challenges are inherent in these games. Players are recommended to play the game because they cannot do the task that the game asks of them – in physical therapy, this may be a specific upper arm movement, in vision therapy it involves the searching of visual fields. To further complicate matters, these two types of challenge may require contradictory design solutions. Physical requirements of therapy may need to progress at regular intervals regardless of success, or lack thereof, with game challenges.

3.4 Considerations Regarding the Research Setting

With respect to the research setting, two main aspects need to be considered. First, while testing games in a focus group setting can generally provide valuable insights that emerge from discussion between participants, the social context of a group setting can be hard to navigate for players with special needs. Particularly when working with older adults, there were several instances where we observed that participants had lack of confidence in their abilities, and were apprehensive to expose themselves in social play, which could have created instances of vulnerability. Likewise, we saw similar tendencies when working with young people using wheelchairs, where a pair of players developed their skills at different speeds and direct comparison with another person introduced risk of frustration as a result of different physical abilities. To this end, researchers need to be ready to moderate the process, and, if necessary, adapt the research context to allow players to engage with games in a safe environment. Second, when carrying out GUR in the field rather than in the lab (e.g., at a school, or community center), researchers need to be prepared to appropriately manage other

attendees who do not participate in the research. For example, when working with children with disabilities, communicating to them that not everyone will be part of the research project may be difficult, and alternative activities should be considered.

In general, these considerations show that Games User Research with players who have special needs can be challenging, but are essential in the development of engaging playful experiences. We hope that our case studies and considerations can aid others in the establishment of accessible GUR processes that are flexible, consider the needs of participants at all stages, and allow them to share their insights and opinions in a respectful, encouraging environment.

4. Conclusion

While Games User Research often looks to improve the experience of the average player, this approach can be difficult when designing for audiences with special needs. Particularly when designing for players with little technology experience or people with disabilities, efforts in GUR should not just focus on the experience of most players, but also ensure that engagement with games does not do harm for those who require more support to be able to play. To this end, researchers and developers bear the responsibility of ensuring that games are appropriate, enjoyable, and empowering for all players, and we hope that the case studies and considerations of this chapter can contribute to the work of those wishing to create positive gaming experiences for broad audiences.

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6. Author Bios

Kathrin Gerling is a Senior Lecturer at the School of Computer Science at the University of Lincoln, where she is part of the Interactive Technologies Lab and the Games Research Group. Her main research areas are Human-Computer Interaction and accessibility; her work examines interactive technologies with a purpose besides entertainment. She is particularly interested in how interfaces can be made accessible for audiences with special needs, and how interactive technologies can be leveraged to support wellbeing. Kathrin holds a PhD in Computer Science from the University of Saskatchewan, Canada, and she received a Master's degree in Cognitive Science from the University of Duisburg-Essen, Germany. Before joining academia, she worked on different projects in the games industry.

Conor Linehan is a Lecturer in Applied Psychology at University College Cork, where he is a member of the People and Technology research group. He holds BA and PhD degrees in Psychology from Maynooth University and until recently worked as a Lecturer at the Social Computing Research Centre at the University of Lincoln. Conor's research expertise lies in the design and evaluation of technology for the promotion of health and wellbeing, education, and behaviour change. He has worked on diverse research projects, investigating the design of educational games, pervasive games, vision therapy programmes, sleep monitors, and online mental health interventions.

Regan Mandryk is an Associate Professor of Computer Science at the University of Saskatchewan. She pioneered the area of physiological evaluation for computer games in her Ph.D. research on affective computing at Simon Fraser University with support from Electronic Arts. With over 100 papers that have been cited over 4000 times, she continues to investigate novel ways of understanding players and player experience in partnership with multiple industrial collaborators, but also develops and evaluates persuasive games, exergames, games for special populations including children with neurodevelopmental disorders, games that foster interpersonal relationships, and ubiquitous games that merge the real world with the game world. She has been the invited keynote speaker at two international game conferences, led the Games theme in the Canadian GRAND NCE, was the papers chair for the inaugural CHI PLAY conference, and is leading the new games subcommittee for SIGCHI.